FIREARM SIMULATION DEVICE

FIELD AND BACKGROUND OF THE INVENTION

The present invention relates to a firearm device. In particular, it concerns a firearm device featuring a barrel unit and a piston unit, wherein the piston unit is accommodated by the barrel unit. Moreover the present invention is of a firearm, which employs compressed air to simulate cycle and recoil.

Firearm simulators have wide use in training systems, which are configured to train personnel in the proper use, judgment, safety, and accuracy in utilizing firearms and in simulation games.

The background art describes a variety of firearm devices and firearm cartridges, which includes U.S. Patent Nos. 5,962,805, 5,842,300, 6,095,051 and 6,253,682.

U.S. Patent No. 5,962,805 discloses a cartridge, which has a case comprising a body housed telescopically within a sleeve. The body encloses a main chamber, which contains gas under pressure, and a valve mechanism for venting gas from the chamber into an expansion chamber. The pressure of the gas in the expansion chamber causes the body to displace rearward relatively to the sleeve to apply a force to the breech block of the weapon in which the cartridge is used, thereby to initiate the reloading cycle. Gas is vented from the expansion chamber to eject a projectile when a spigot projecting from the body is withdrawn from an aperture in the end wall of the sleeve.

U.S. Patent No. 6,095,051 discloses a cartridge for use in a firearm, the cartridge having a projectile mounted in or on a nose portion thereof; the cartridge interior communicating with the projectile via a gas passage, a valve for controlling propellant gas flow through the gas passage, and a movable member, which upon firing is propelled rearward from the cartridge against a breech block of the firearm by the pressure of propellant gas within the cartridge so as to recycle the firearm; characterized in that the valve is arranged to close in order to stop or substantially reduce the flow of propellant gas through the said gas passage after the projectile has been fired from the cartridge, thereby to facilitate rearwards propulsion of the movable member.

U.S. Patent No. 6,253,682 discloses a cartridge comprising a casing having a passage extending there through. A core member is slidably received in the passage, and has a forwardly facing piston surface and a portion closing the forward length of passage in the inactivated condition of the cartridge. A cavity within the core member receives propellant gas from a primer and discharges the gas into the passage forwardly of the piston surface. The core is propelled rearward and releases propellant gas into the forward passage section.

U.S. Patent No. 5,842,300 describes a retrofittable laser system with which a user can convert his/her own personal firearm to a training firearm simulator incapable of firing live ammunition and then convert back to the original operational firearm configuration. More particularly, the present invention relates to retrofittable laser system, which is integrally mounted within a standard barrel of the laser simulator barrel and electronic means

firearm having power mountable in a retrofittable ammunition magazine. An optional recoil means may also be incorporated into the retrofittable barrel and/or retrofittable ammunition magazine.

Disadvantages associated with the simulation firearm devices of the background art include high cost of bullets and the need to replace the bullets, due to wear and tear. The background art does not provide a firearm device, whereby the piston is part of the barrel. Such a device as in the present invention provides a mechanism, which can use compressed gas or fluid to simulate cycle and recoil of a weapon, which can be used indefinitely and is less costly than using bullets.

There is therefore a need for a firearm device, such as disclosed in the present invention. Such a firearm device provides a solution to the problems of costly bullets and slow magazine change, which are associated with simulation firearm devices of the art.

SUMMARY OF THE INVENTION

The present invention relates to a firearm device. In particular, it concerns a firearm device featuring a barrel unit and a piston unit, wherein the piston unit is accommodated by the barrel unit. Moreover the present invention is of a firearm, which employs compressed gas to simulate cycle and recoil.

In a first embodiment the present invention provides a firearm device including (a) a source of compressed gas; (b) a mechanism for releasing the source of compressed gas; and (c) a piston configured to readily facilitate

cycling the piston's response to force of the compressed gas.

In a second embodiment the present invention provides a firearm device including (a) a replaceable source of compressed gas; and (b) a barrel including (i) a chamber for containing a piston; (ii) a piston for receiving the compressed gas source and for cycling the action; (iii) a primer simulator; and (iv) a firing pin for readily facilitating striking the primer simulator, the firing pin connected to the piston.

In a third embodiment the present invention provides a method of firing a firearm device including the steps of; (a) providing a firearm device, wherein the firearm device includes (i) a source of compressed gas; (ii) a mechanism for releasing the source of compressed gas; and (iii) a piston configured to readily facilitate cycling the piston's response to force of the compressed gas; and (b) pulling trigger of the firearm device readily facilitating the following steps (i) striking by firing pin of a primer simulator; (ii) releasing of compressed gas from a magazine containing the compressed gas into the piston; (iii) cycling and recoil of the piston resulting from pressure of the compressed gas; and (iv) releasing of the compressed gas from the piston.

In a preferred embodiment the compressed gas is air.

In a preferred embodiment the firearm device further includes a magazine. Preferably the magazine contains the source of compressed gas.

In a preferred embodiment the magazine includes at least one gas pipe.

In a preferred embodiment the firearm device further includes a chamber for containing the piston.

In a preferred embodiment the piston includes (a) a plurality of vents for readily facilitating compressed gas to flow into the piston from the chamber for containing the piston; (b) a plurality of gas outlets for releasing the compressed gas; and (c) a shoulder for readily preventing the piston from being ejected.

In a more preferred embodiment the piston includes (a) a left side of piston, which is smaller than the chamber aperture; (b) a plurality of gas feelers; and (c) at least one gas inlet configured to readily facilitate gas flow from the magazine containing the source of compressed gas.

In a preferred embodiment the pressure of the compressed gas in the piston is from about 150 atmospheres to about 200 atmospheres.

In a preferred embodiment the pressure of the compressed gas in the piston displaces a slide.

In a preferred embodiment the at least one gas pipe readily facilitates flow of the compressed gas source into the chamber for containing the piston.

In a preferred embodiment the mechanism for releasing the source of compressed gas includes (a) a primer simulator located at one end of the chamber for containing the piston; (b) a firing pin configured to readily facilitate striking of the primer simulator and releasing of the source of compressed gas; and (c) an gas pipe configured to release source of compressed gas from the magazine.

In a preferred embodiment the firing pin is selected from the group consisting of internal firing pin, external firing pin or a combination thereof.

In a preferred embodiment the firearm device is for use in combination

with any firearm.

In a preferred embodiment the firearm device is reusable.

In a preferred embodiment the firearm device is for use in firearm simulation training.

In a preferred embodiment the source of compressed gas is replaceable.

In a preferred embodiment the firearm device further includes a trigger.

In a preferred embodiment the firearm device further includes (a) a duct; and (b) a disc with hole. Preferably, the piston includes (a) a proximal piston end, which is proximal to duct and which is smaller than the chamber aperture; (b) a plurality of gas sealers to prevent gas escaping; and (c) at least one gas inlet hole configured to readily facilitate gas flow from the magazine containing the source of compressed gas. Preferably, the mechanism for releasing the source of compressed gas includes (a) a primer simulator located at an extremity of the piston; (b) a firing pin configured to readily facilitate striking of the primer simulator and releasing of the source of compressed gas; (c) an gas pipe configured to release source of compressed gas from the magazine to the chamber; and (d) an gas inlet in the piston for gas to flow from the chamber into the piston.

In a fourth embodiment the present invention provides a firearm device including (a) a hydraulic source of compressed fluid; (b) a mechanism for releasing the source of compressed fluid; and (c) a hydraulic piston configured to readily facilitate cycling the piston's response to force of the compressed fluid. Preferably, the fluid is water. In a preferred embodiment the mechanism

for releasing the source of compressed fluid includes (a) a primer simulator located at one end of a chamber for containing the piston; (b) a firing pin configured to readily facilitate striking of the primer simulator and releasing of the source of compressed fluid; and (c) an actuator for readily displacing the firing pin, such that the primer simulator simulates the action of a primer.

The term 'compressed gas' as used herein, includes but is not limited to gas at a higher pressure than atmospheric pressure.

The term 'gas' as used herein, includes, but is not limited to any suitable gas or combination of gases, including, but not limited to air, nitrogen, oxygen, argon and carbon dioxide. Preferably, the term 'gas' as used herein is air.

The term 'piston' as used herein includes but is not limited to a cylindrical element that slides to and fro in a hollow container.

The term 'magazine' as used herein, includes, but is not limited to a case, usually metal for holding cartridges, ammunition, or any other cartridge simulation element employed in firearms. The term includes integral magazines and replaceable magazines.

The term 'slide' as used herein, includes, but is not limited to a firearm element, which displaces back along a surface as a result of the firearm being used.

The term 'firing pin' as used herein, includes, but is not limited to an elongated metallic element for readily displacing and/or impacting a primer and/or primer simulator.

The term 'primer simulator' as used herein, includes, but is not limited

to an element, which when hit initiates the firing process of the firearm causing the compressed gas to flow out of the magazine. The term includes affecting an initial input to set a process going

The term 'cycling' as used herein, includes, but is not limited to an action of a weapon, such that the weapon performs at least one cycle of loading and firing.

The term 'recoil' as used herein, includes, but is not limited to the action of the firearm jerking backwards, as a result of firing of the firearm.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is herein described, by way of example only, with reference to the accompanying drawings, wherein:

FIG. 1 shows a schematic view of a first embodiment of the firearm device of the present invention;

FIG. 2 shows a schematic view of the piston of a first embodiment of the present invention;

FIG. 3 shows a schematic view of a second embodiment of the firearm of the present invention; and

FIG. 4 shows a schematic cross section of the piston mechanism of a preferred embodiment of the firearm of the present invention;

FIG. 5 shows a schematic view of a preferred embodiment of the present invention before the firearm is fired; and

FIG. 6 shows a schematic view of a preferred embodiment of the present invention after the firearm has been fired.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates to a firearm device. In particular, it concerns a firearm device featuring a barrel unit and a piston unit, wherein the piston unit is accommodated by the barrel unit. Moreover the present invention is of a firearm, which employs compressed gas to simulate cycle and recoil.

The firearm device of the present invention is geared towards a multiplicity of different users including, but not limited to the police force, army, security groups and firearm sportsmen.

The principles and operation of a firearm device, according to the present invention may be better understood with reference to the drawings and the accompanying description. The figures are not limiting.

Figure 1 shows a schematic view of a first embodiment of the firearm device of the present invention **10**. As can be see in Figure 1, firearm device **10** includes a source of compressed gas **11**, a mechanism **12** configured to release gas from the source of compressed gas, and a piston **14** configured to readily facilitate cycling piston **14** in response to force of the compressed gas. Preferably, firearm device of the present invention **10** features a barrel **13**, a magazine **15**, a firing pin **16**, a chamber **18** for readily accommodating a piston, a piston **14** and a plurality of vents **20**.

Preferably, magazine **15** contains source of compressed gas **11**.

Preferably, source of compressed gas **11** is replaceable. Preferably, compressed gas is compressed air. Preferably, compressed gas **11** replaces the use of live ammunition in the device of the present invention **10**. Magazine **15** is made from any suitable material, such as aluminum, steel, stainless steel, alloy and the like. Preferably, magazine **15** is reusable and can be reused substantially indefinitely.

Mechanism **12** for releasing gas from source of compressed gas **11** includes a firing pin **16**, a primer simulator **21** and a gas pipe **22**. Firing pin **16** is made from any suitable material. Preferably, when firing pin **16** strikes primer simulator **21**, which is situated at a far end of chamber **18** for readily accommodating piston, compressed gas **11** from magazine **15** flows out of magazine **15** through gas pipe **22**.

Compressed gas **11** flows through vents **20** into chamber **18** and into piston **14**. Gas pressure builds up in piston **14**. Preferably, a pressure of about 150 to about 200 atmospheres is produced. Preferably, the resulting pressure of the compressed gas displaces piston **14** rearward, thereby cycling the action and simulating how a gun with live ammunition works. Preferably, compressed gas **11** is released by at least one gas release valve **28**. Optionally, the cycling action can produce a sound or be silent.

The device of the present invention **10** can be made from any regular firearm, by replacing the barrel and magazine with barrel **13** and magazine **15** of the present invention.

The device of the present invention **10** can be used in any type of gun

simulation training or maneuver, such as a two sided drill, whereby one person can aim and fire a gun at a second person.

In an alternative embodiment, the firearm device of the present invention **10** works using a hydraulic mechanism, whereby compressed gas **11** is replaced with fluid, such as water. Optionally, any firing pin **16** can be used. Figure 1 shows an external firing pin **16**. When firing pin **16** strikes primer simulator **24**, which is situated at a far end of chamber **18** for readily accommodating hydraulic piston **14**, an actuator (not shown in figure 1) readily facilitates flow of fluid from magazine **15** through vents **20** into chamber **18** and into piston **14**. Piston **14** is preferably a hydraulic piston. Fluid pressure builds up in piston **14**. The resulting pressure of the fluid displaces piston **14** rearward, thereby cycling the action and simulating how a gun with live ammunition works. Optionally, the fluid is released via at least one fluid outlet **28**. Optionally, the cycling action can produce a sound or be silent.

Figure 2 shows a schematic view of a piston **14** of a first embodiment of the firearm device of the present invention **10**. As can be see in Figure 2, piston **14** features a piston body **30**. Piston body **30** includes a plurality of vents **20** and gas outlets **28** and a shoulder **32** for readily limiting lateral displacement of piston **14**. Preferably, when primer simulator (not shown in figure 2) has been struck, gas is pushed out of magazine (not shown in figure 2) through plurality of vents **20** into piston **14**, which is accommodated by a chamber to accommodate a piston (not shown in figure 2). Piston **14** is configured to readily be displaced backwards and forwards. Shoulder **32** prevents piston **14**

from being ejected from chamber. Compressed gas is subsequently released from piston **14** by way of gas outlets **28**. Body of piston can be made from any suitable material, such as aluminum, steel, stainless steel, tungsten carbide, reinforced carbon fiber, iron and the like.

Figure 3 shows a schematic view of a second embodiment of the firearm device **40** of the present invention utilizing a hammerless internal firing pin mechanism **49**. As can be seen in figure 3, firearm device **40** includes a source of compressed gas **45**, a mechanism **46** for releasing gas from source of compressed gas, and a piston **47** configured to readily facilitate cycling a slide **58** in response to force of compressed gas **45**. Firearm device **40** features a barrel **42**, a magazine **44**, a firing pin **49**, a chamber **48** for readily accommodating a piston, a piston **47**, a primer simulator **52** and a plurality of vents **54**.

Preferably, magazine **44** contains compressed gas **45**. Preferably, source of compressed gas **45** is replaceable. Preferably, compressed gas **45** replaces the use of live ammunition in the device of the present invention **40**. Magazine **44** is made from any suitable material. Preferably, magazine **44** is reusable and can be reused indefinitely. More preferably, magazine **44** includes a valve **41** for readily facilitating filling magazine **44** with compressed gas.

Mechanism **46** for releasing source of compressed gas **45** includes a firing pin **49**, a primer simulator **52** and a gas pipe **56**. Firing pin **49** is made from any suitable material. In the embodiment shown in figure 3, firing pin **49** is a hammerless internal firing pin **49**. When firing pin **49** strikes primer

simulator **52**, which is situated at a far end of piston **47**, compressed gas **45** from magazine **44** flows through gas pipes **56**.

Compressed gas **45** flows via vents **54** into chamber **48** and into piston **47**. Pressure builds up in piston **47**. Preferably, a pressure of about 150 to about 200 atmospheres is produced. Preferably, the resulting pressure of the compressed gas displaces slide **58** rearward, thereby cycling the action and simulating how a gun with live ammunition works. Preferably, compressed gas **45** is released by at least one gas release valve **60**. Optionally, the cycling action can produce a sound or be silent.

The device of the present invention **40** can be made from any regular firearm, by replacing the barrel and magazine with barrel **42** and magazine **44** of the present invention.

The device of the present invention **40** can be used in any type of gun simulation training or maneuver, such a two sided drill, whereby one person can aim and fire a gun at a second person.

In an alternative embodiment, the firearm device of the present invention **40** works using a hydraulic mechanism, whereby the compressed gas is replaced with fluid, such as water. When firing pin **49** strikes primer simulator **52**, which is situated at a far end of chamber for readily accommodating hydraulic piston **47**, an actuator (not shown in figure 3) readily facilitates flow of fluid from magazine **44** through vents **54** into chamber **48** and into piston **47**. Fluid pressure builds up in piston **47**. The resulting pressure of the fluid displaces slide **58** rearward, thereby cycling the action and simulating how a

gun with live ammunition works. The fluid is released via at least one fluid outlet **60**. Optionally, the cycling action can produce a sound or be silent.

Preferably, the firearm device of the present invention **40** is used by a user in the following way. User activates trigger **62**, by any suitable action preferably by pulling trigger **62**. Pulled trigger **62** readily facilitates firing pin **49** striking primer simulator **52**. Preferably, the action of primer simulator **52** being hit causes flow of gas **45** from magazine **44** through gas pipe **56** into chamber **48** and through vents **54** into piston **47**. Gas pressure builds up in piston **47**, causing cycling of action and displacement of slide **58** rearward, simulating recoil. Gas **45** escapes from piston **47** through gas outlets **60**.

Alternatively, compressed gas **45** readily flows into piston **47** and pulling trigger **62** facilitates piston **47** to be displaced rearwards, thereby displacing slide **58** and cycling an action.

Figure 4 shows a schematic view of the piston mechanism **70** of a preferred embodiment of the firearm of the present invention. As can be seen in figure 4, barrel **72** preferably, includes at least two barrel sections **74** and **76**. Preferably, at least two barrel sections **74** and **76** are tapped, wherein preferably, forward barrel section **74** is readily configured to be screwed into chamber barrel section **76**.

Forward barrel section **74** includes a duct **78**. In a most preferred embodiment, duct **78** has a diameter of about 3mm to about 5mm and a length of about 20mm to about 35mm. A protrusion **80**, which is preferably, attached to or integrally formed with a piston **82** is accommodated by a disc **84** with a

hole **86** formed in disc **84** and readily accommodated and situated in adjacency to duct aperture **88** formed at an end of duct **78**.

Chamber barrel section **76** features a chamber **90** for readily accommodating a piston **82** and a gas pipe **92**, through which gas flows from a magazine containing a source of compressed gas **91**.

Optionally, when barrel **72** is unscrewed into two sections **74** and **76**, piston mechanism **82** and disc **84** are inserted. Piston mechanism **82** includes a proximal piston end **92**, which is proximal to duct **78** and which is larger then chamber aperture **94**. Due to the size restriction, piston **82** is unable to displace to the right beyond a certain degree. Preferably, piston end **92** features a shoulder **93**. Piston **82** features a plurality of air sealers **96**, which are configured to prevent gas escaping. Piston **82** includes at least one hole **97**, which is readily restricted by a counter shoulder **95**, through which gas, which flows into chamber through gas pipe **92** enters piston **82**. Piston **82** further features primer simulator **98**, which is located at distal piston end **99**, wherein distal piston end **99** is distal in relation to duct **78**.

Figure 5 shows a schematic view of a preferred embodiment of the firearm device **100** of the present invention before the firearm has been fired. As can be seen in figure 5 firearm device **100** includes a source of compressed gas **102**, a mechanism **104** configured to release the gas **102**, and a piston **106** configured to readily facilitate cycling a slide **107** in response to force of the compressed gas **102**.

Firearm device of the present invention **100** preferably, features a barrel

108, a magazine 110, a firing pin 112, a chamber 114 for readily accommodating a piston, a piston 106, duct 116 and a trigger 117.

Preferably, magazine 110 contains source of compressed gas 102. Preferably, compressed gas is air. Preferably, source of compressed gas 102 is replaceable. Preferably, compressed gas 102 replaces the use of live ammunition in the device of the present invention 100. Magazine 110 is made from any suitable material. Preferably, magazine 110 is reusable and can be reused substantially indefinitely.

A primer simulator 118, is preferably, attached or integrally formed with piston 106. Preferably, cycling of the mechanism of firearm device of the present invention 100 is initiated when trigger 117 is pulled, thereafter firing pin 112 strikes primer simulator 118, which is situated at a far end of piston 106. Thereafter, air from piston 106 flows against a disc 125. Thus creating a counter force for readily displacing piston 106 and slide 107 rearward. Piston 106 includes a proximal piston end 120, which is proximal to duct 116 and which is larger then chamber aperture 122. Due to the size restriction, piston 106 is unable to displace beyond a certain degree. Preferably, piston end 120 features a shoulder, which is readily restricted by a counter shoulder. Piston 106 features a plurality of air sealers 124, which are configured to prevent gas escaping. Piston 106 is attached to disc 125 with a hole 126, formed in disc 125 for readily accommodating and readily accommodated and situated in adjacency to duct 116.

Mechanism 104 for releasing source of compressed gas 102 includes a

gas pipe **127** for gas to freely flow from magazine **110** to chamber **114**, at least one air hole **128** in piston **106** facilitated gas to enter and flow through piston **106** and an air outlet **129** in duct for gas to escape out of barrel **108** after firing. Preferably, compressed air freely flows in the preferred embodiment of the invention.

Before trigger **117** is pressed protrusion (not shown in figure 5), which is preferably, attached to or integrally formed with piston **106** is accommodated by disc **125** with hole **126**. Preferably, a bias **115** applies sufficient force and/or pressure to situate piston **106** substantially against disc **125**.

When trigger **117** is pressed, firing pin **112** displaces laterally, striking primer simulator **118** and displaces primer simulator **118** forward.

Figure 6 shows a schematic view of a preferred embodiment of the firearm device **130** of the present invention after the firearm has been fired. As can be seen in figure 6 firearm device **130** includes a source of compressed gas **132**, a mechanism **134** configured to release the source of compressed gas **132**, and a piston **136** configured to readily facilitate cycling a slide **156** in response to force of the compressed gas **132**.

Compressed gas **132**, which is flowing through gas pipe **144** between duct **146** and piston **136** flows through hole **148** into piston **136** and a plurality of air sealers **150** attached to piston **136**, prevent gas from escaping. After a trigger **138** is pressed, a firing pin **140** displaces laterally, thereby striking a primer simulator **142** and pushing primer simulator **142** forward. Flow of gas in piston **136** pushes against disc **152** with hole **154**, which causes a blow back

action resulting in piston **136** displacing to the right and slide **156** displacing to the right. Preferably, piston **136** displaces substantially 1mm to 7mm, thereafter gas escapes through hole **154** into duct **146** and out of barrel exit **158**. Preferably, a bias **159**, which is located in adjacency to barrel **160**, applies force and/or pressure sufficient to displace slide **156** back to its original position. Optionally, the cycling action can produce a sound or be silent.

It will be appreciated that the above descriptions are intended only to serve as examples, and that many other embodiments are possible within the spirit and the scope of the present invention.